Project Definition

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HIGH LEVEL DESCRIPTION

- AirLift or HMS (Height Maintenance System)
- Keeps itself at a desired height using a propeller. When it is pushed downward, pulled upward, has weight added to it, or has weight removed to it, it will change its speed to get back to the original desired height.

PURPOSE

- The AirLift is a small piece to understanding the complexities that are required to build a drone. One of the biggest issues with making a drone is keeping the drone stable in the air while also moving. We are limiting the scope of the drone to simply stay hovering and be able to go up and down on one axis depending on outside forces. With the outside forces, it will know how to respond in order to get back to the same height it was hovering at originally.

COMMUNICATION

- Github Repository

OBJECTIVES

- The AirLift is meant to be a single propeller drone that is autonomous and hovers at a specific height. I can get back to the original height even when weight is added or removed.

SCENARIO

User Interaction Stories

- To begin using the drone, it has to be placed in the frame. Once in the frame and flat on the surface, it can be turned on using the button on the side.
- While running, the drone will simply hover. At this point, weight can be added in the designated areas to cause it to lower and it will then increase the thrust produced to get back to the original hovering position. It will do the opposite when weight is removed.
- To turn it off, make sure it's back to the original hover position and then press the button on the side.
- Red and Green LEDs are used as the user interface. Green means that the drone can be interacted with while red means to wait.

User Interface

- The user interface is based on red and green LEDs to show different states of the drone. The button on the side of the drone is used to turn it on or off.

User Acceptance

- Given-When-Then Criteria
    - Given: Some external force
    - When: The external force causes a change in height of the propeller
    - Then: Propeller will change its motor speed to get back to the "equilibrium" point

- If the propeller always ends up at the same “equilibrium” point, it means that the purpose is being accomplished.

PARAMETERS

Technical

- The design of the frame is still being worked on but it will be tall and will house the drone inside, limiting its movement to just up and down.
- The weight isn’t known yet but what is known is that it has to weigh around half of the thrust created by the propeller.
- The drone itself will have all the electronics in its chassis. The frame is separate from the frame.

Functions

- The drone can hover on its own at a distance dictated in the programming
- The drone can increase the thrust created to go up.
- The drone can decrease the thrust created to go down.

Operational

- The battery has to be big enough to power all the electronics but also last around a couple of hours for testing and demonstration.

Environmental

- The only thing is to have enough light so the laser of the distance sensor can work properly.

FUTURE

- Use this knowledge to go for an actual drone with no frame to keep it moving only on one axis.

GLOSSARY

- Drone - A device with a single motor that allows it to hover up and down.
- Chassis - The 3D printed housing of the drone. All electronics will be inside.
- Equilibrium Point - The starting height that the propeller will stay at and will always try to get to when outside forces are put onto it.